

NON-TECHNICAL SUMMARY

STUDY TITLE: Environmental Investigation of the Use of Shoals Offshore Delaware and Maryland by Mobile Benthos and Finfish Species

REPORT TITLE: Comparisons Between Marine Communities Residing on Sand Shoals and Uniform-Bottom Substrate in the Mid-Atlantic Bight

CONTRACT NUMBER: MMS 1435-01-02-CT-85060

SPONSORING OCS REGION: Headquarters-Leasing Division, Marine Minerals Branch

APPLICABLE PLANNING AREA: East and Gulf of Mexico Coasts

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COSTS: FY 2003: \$250,528.00, FY 2004: \$165,496.00, FY 2005: \$83,219.00

Cumulative Cost: \$499,216.00

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BACKGROUND: Many of the beaches along the Mid Atlantic Bight (MAB) are undergoing long-term erosion due to sea level rise, human activities, and from severe coastal storms. In efforts to try to restore beaches lost to erosion various state and federal governmental agencies have ongoing or proposed beach stabilization projects that require significant sand resources to complete. As the need to replenish beaches increases new sand resources will be required and those will likely be taken from federal waters. The Minerals Management Service (MMS) has jurisdiction over all mineral resources occurring in federal waters. The MMS along with both Maryland and Delaware Geological Survey have identified four specific sand shoals off of their coasts as potential resources for long-term sand mining. The specific shoals are, Shoal B, Shoal D, Fenwick Island Shoal, and Weaver Shoal. If shoals provide important habitat to specific marine communities, then mining activities could have negative impacts to those communities,

and before mining can occur, information must be gathered pertaining to what species of fish and mobile benthos may be affected by mining.

OBJECTIVES: The main objectives of this study were to 1) determine what species of fish and mobile benthos reside at offshore sand shoals, and 2) evaluate if the shoals represent important habitat for those species.

DESCRIPTION: The study was located on the inner continental shelf of the MAB region off the coast of Maryland and Delaware. The primary focus was four sand shoals; shoal B, D, Fenwick, and Weaver, and four flat-bottom reference sites. The shoal and reference areas were located between 16 and 25-km off the coast and encompass approximately 800 square km of the inner shelf.

This study was designed to compare the distribution, total relative abundance, and diversity of finfish and mobile benthos species residing on the shoals and nearby uniform-bottom habitat. Four pairs of sites were established by pairing each of the four shoals to a specific uniform-bottom reference site. A multi-year comprehensive fisheries study consisting of daytime trawling, gillnetting and nighttime bioacoustics was employed to compare and contrast the abundance, diversities and distribution of fish and mobile benthos communities between the shoals and reference sites.

Comparisons between species relative density, species richness, and diversity were performed between shoals and reference sites for each season and gear. There were mixed results with generally higher numbers of total species abundance, species richness, and species diversity at the reference sites in trawls and no clear patterns in gillnet data. There were seasonal differences in species densities throughout the study at all the sampling sites and between all gears.

Four groups or species were defined from the fisheries net data; they were benthic finfish, benthic invertebrates, pelagic finfish, and pelagic invertebrate. Analysis of these groups showed that more benthic finfish, pelagic finfish, and pelagic invertebrates (squid) were captured in the commercial and small trawls at reference sites than at shoals. Each of the trawl gears captured benthic invertebrates in nearly equal numbers at shoal and reference sites. Capture rates in gillnets differed from those in trawls. In gillnets, all groups except pelagic invertebrates were captured in about equal numbers, and no differences were detected. No pelagic invertebrates were captured in gillnets.

There was strong separation of sites according to season. Shoal and reference samples collected with the small trawl showed a tendency to form groups in spring and summer, but not in fall or winter. For the commercial trawl samples, there was a tendency for shoal and reference samples to group in summer, a clearer pattern of separation in fall and winter, and no pattern in spring. No structure existed for the gillnet samples that would suggest differences between the shoal and the reference sites. Differences in species composition between the shoal and the reference sites could be interpreted for the small trawl and commercial trawls, but not the gillnet data.

Six seasonal bioacoustic surveys in all seasons but winter were conducted at each pair of sites over the two year study. In general, fish densities and biomass fluctuated between sites throughout the seasonal surveys. Differences between individual shoals and their reference sites were found in many seasons and some patterns are evident within site pairs in the bioacoustic data.

Two consecutive years of fisheries monitoring in Federal waters off the coast of Maryland and Delaware documented that there are significant seasonal variations in species richness and abundances at the shoals and reference sites in this region of the MAB. There were also yearly variations in abundance, but overall the seasonal patterns of species assemblages are consistent and the majority of the species inhabiting the shoals and reference site habitats are seasonal residents. Comparisons between the net and bioacoustic data suggest that pelagic fish are using habitats differently between day and night. Multiple analyses were conducted on the data collected over the two years and from those analyses we conclude that, 1) fish and squid occurring in the MAB either have no preference or prefer substrates at uniform-bottom types to sandy shoals during the day, 2) benthic invertebrates have no preferences for shoals over uniform-bottom types during the day, and 3) there are diel (Day/Night) differences in the abundance of pelagic fish using the shoals and reference sites. These data suggest fish could be using the adjacent uniform-bottom habitats during the day and move onto the shoals at night to exploit new habitat, in which case shoals could represent an important resource for fish at night.

STUDY PRODUCTS: Slacum, H.W. JR., W.H. Burton, J.H. Volstad, J. Dew, E. Weber, R. Llanso, D.Wong. 2006. Comparisons Between Marine Communities Residing on Sand Shoals and Uniform-Bottom Substrate in the Mid-Atlantic Bight. Final Report to the U.S. Department of the Interior, Minerals Management Service, International Activities and Marine Minerals Division, Herndon, VA. Contract No. 1435-01-02-CT-85060.

H. Ward Slacum Jr. and William H. Burton. Environmental Investigation of the Use of Shoals Offshore Delaware and Maryland by Mobile Benthos and Finfish Species. Presentation given at the Minerals Management Service Offshore Sand Workshop Thursday, Oct. 23, 2003, University of Delaware.

H. Ward Slacum Jr. and William H. Burton. Environmental Investigation of the Use of Shoals Offshore Delaware and Maryland by Mobile Benthos and Finfish Species. Presentation given at the Tidewater Chapter of the American Fisheries Society Meeting January 2, 2004, Salisbury University.

H. Ward Slacum Jr., William H. Burton, Jon Volstad, Jodi Dew, and Ed Weber. 2005. Differences in Relative Abundance of Marine Guilds Residing on Offshore Sand Shoals and Flat-Bottom Substrates in the Mid-Atlantic Bight. Presentation at the 2005 Annual Estuarine Research Federation (ERF) Meeting. Norfolk, VA.